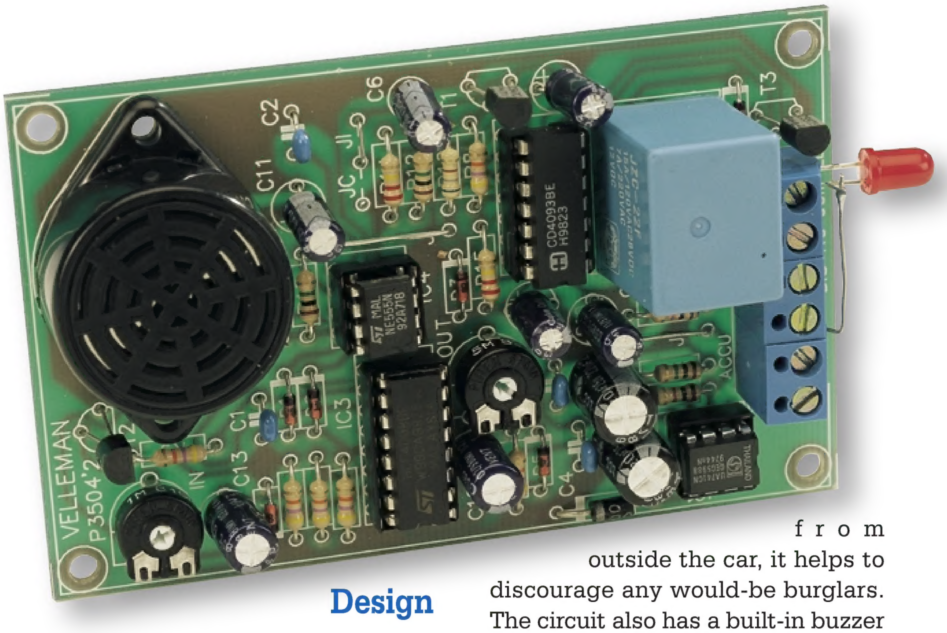
Car Burglar Alarm

employs battery voltage detection

Kit review by S. van Rooij

This time, Velleman have sent us a car burglar alarm construction kit for evaluation. This is a fairly simple but highly functional circuit, which is also offered at a very reasonable price.



We don't know Velleman's sales figures, but we know from our own experience that burglar alarms — and in particular car burglar alarms — are almost without exception guaranteed success numbers. This is due not so much to the quality or originality of whatever circuit may be used, but simply to the intended use of the circuit. Burglary has always been a serious problem, but a steadily rising level of criminal activity has unfortunately made good protection of valuable goods more and more of a bitter necessity.

This necessity applies to cars even more than to other goods. A car represents a significant amount of capital and it can easily be sold, and its owner is frequently forced to park in locations where the car is easy prey for persons with dubious intentions. A reliable alarm system is the only thing that can prevent such persons from carrying out their nefarious activities.

Overall, alarm systems can be divided into two categories. The first category consists of systems that make it impossible to start the engine or drive away without knowing the correct code. These systems are the most reliable, but they are also the most expensive and are especially difficult to install yourself. The second category consists of all types of alarms that generate a warning signal when there is an attempted burglary, with the objective of scaring off the would-be thief. This is somewhat less effective, since in principle you can still just drive away with the horn blowing. However, this is not all that likely, and alarms of this sort have the advantage that they are fairly easy to install yourself. The Velleman kit is an 'alarm signal generator' and thus belongs to the second category.

Design

This circuit works without any separate sensors. It uses the battery voltage as its input information. Whenever someone enters the car, the interior light or the boot light will always go on, which causes the battery voltage to drop slightly. This voltage variation activates a control circuit, which in turn activates the horn (or an external siren) via a relay. The alarm can be enabled using the ignition switch or a separate remote control unit. Naturally, time delays are provided for entering and leaving the car, so that the rightful owner of the car has enough time to switch the alarm off or on.

Although the design of the alarm circuit has been keep extremely simple, it still has a couple of extra features. For example, a blinking LED indicates that the alarm is armed. If this LED is fitted so that it is visible from outside the car, it helps to discourage any would-be burglars. The circuit also has a built-in buzzer to remind you that the alarm is on when you get into the car, so you won't forget to switch it off.

The entry and exit delay times are both adjustable. The maximum entry delay is 30 seconds, while the maximum exit delay is 3 minutes. The length of time that the alarm signal sounds is limited to the legally specified value of 60 seconds. After this time, however, the alarm automatically rearms itself, so that the horn will start blowing again if the burglar has not stopped his nasty work in the mean time.

Three timers

The schematic diagram of the car burglar alarm is shown in **Figure 1**. Three components — M1, M2 and IC4 — stand out in this diagram. All three are timers that are wired as

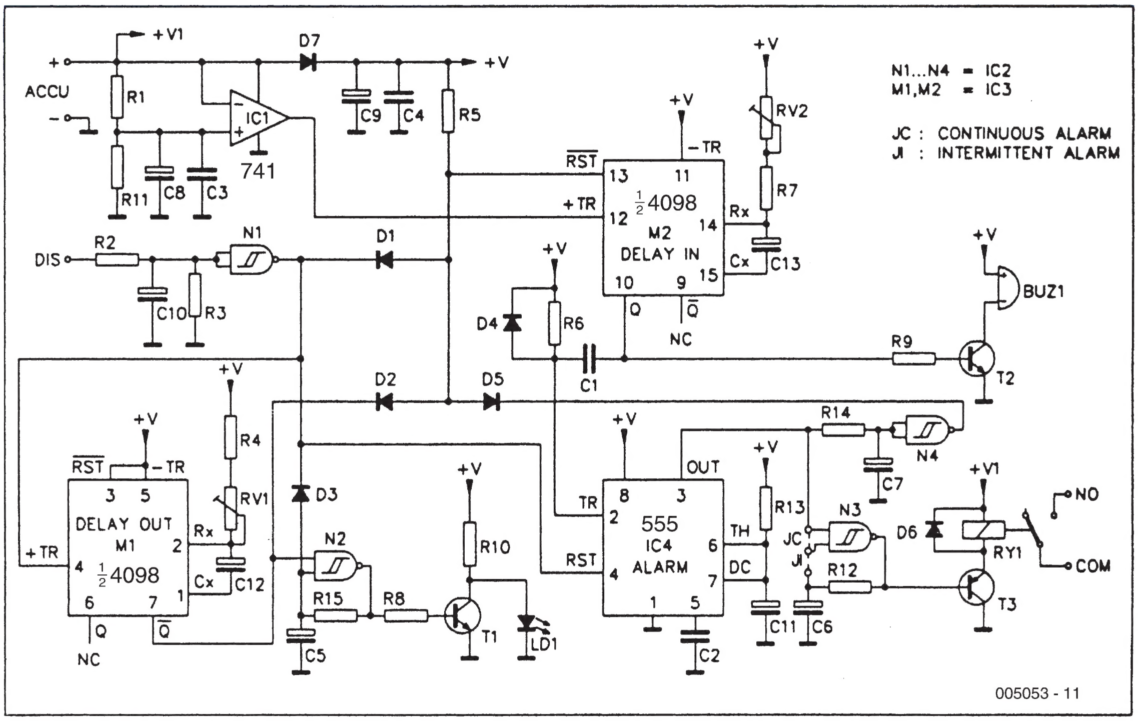


Figure 1. Schematic diagram of the car alarm. It primarily consists of several timers that provide the necessary time delays.

monostable multivibrators. They effectively form the heart of the circuit. Other essential components are opamp IC1, the warning LED LD1, buzzer BUZ1 and finally relay RY1, which activates the horn or siren.

The connections marked 'ACCU' serve as the sensor input. They are connected directly to the car battery. The DIS input is used to enable the alarm. This input is connected to a 'positive' lead *after* the ignition switch, possibly via a secret switch. If you omit the secret switch, the alarm is armed by the ignition switch itself. The alarm is enabled when DIS is 'low', which means when the ignition switch is *off*.

Now let's have a brief look at how it all works. As long as the car is being driven, the DIS input will be held 'positive' by the ignition switch. This means that timer M2 is held reset via N1 and D2, so that nothing happens.

As soon as you stop the car and switch off the ignition, DIS goes 'low'. This causes a positive trigger pulse to be sent from the output of N1 to monoflop M1, which is responsible for the exit delay. During this delay time, which can be adjusted using RV1, the /Q output of M1 takes over the job of blocking monoflop M2 (which was previously done via D1). As soon as the delay time is expired, the reset signal is no longer applied to M2, and the alarm is armed. At the same time, the astable multivibrator built around N2 is enabled, and LED LD1 starts to emit warning blinks.

If one of the car doors is opened while the alarm is armed, the battery voltage drops slightly, due to the fact that the interior light goes on. This change in the battery voltage is detected by a comparator circuit built around IC1. This produces a trigger pulse for M2, which is the monoflop that is responsible for the entry delay. When the entry delay timer starts, buzzer BUZ1 is activated from the Q output of M2 via transistor T2. If the ignition is switched on during the entry delay time, which can be adjusted using RV2, M2 is reset and the buzzer is muted. However, if DIS does not go 'positive' within at most 30 seconds, a negative trigger pulse is generated when the monostable time expires. This pulse is applied to the trigger input of the third monostable, IC4. The relay is activated via T3, and it in turn activates the horn or siren. At the same time, a reset pulse is sent to M2 via N4 to rearm the alarm.

An astable multivibrator can also be switched into the circuit using a jumper. This provides a choice between a continuous or intermittent alarm signal.

Construction and fitting

The kit is accompanied by a clear set of instructions, which should avoid any problems in the construction of the circuit. We had a problem with mounting C8 and C9, since the types supplied with the kit were too large and did not fit on the circuit board. A bit of rummaging around in our own components drawer quickly solved this problem.

The instructions also provide clear information regarding connecting the circuit board in the car and installing the necessary wiring, complete with a few schematic diagrams. The possibility of using an infrared code lock instead of the ignition switch to enable and disable the alarm is also discussed.

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A complete construction kit for the Car Alarm can be obtained from Velleman, Belgium. The kit, part number K3504, is priced at US$19.95 and available from electronics retail shops. In the UK, a selection of Velleman kits is stocked by Maplin.

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